SCIENCE.

FRIDAY, DECEMBER 19, 1884.

COMMENT AND CRITICISM.

THE KOWAK or Kūak River, to the exploration of which attention has been recently attracted, was first entered by Elson, of Beechey's expedition, in 1826; the opening being indicated on their rough sketch of Hotham Inlet. Its name and general character were ascertained in 1849 by officers of the Plover, who ascended it to the point where large trees begin to maintain themselves. An account of these investigations appeared in the Parliamentary papers of 1855, and was republished in the Arctic papers of the Royal geographical society in 1875. Placed on the map of north-western America by Petermann in 1859, with its name, this river has appeared in some shape or other on every good map of Alaska issued since. We have referred to the later observations of Jacobsen and Woolfe in 1882 (*Science*, iv. p. 474), and have since learned that the river was ascended some twenty-five miles in 1874 by Capt. E. E. Smith. In 1883 Lieut. Stoney was furnished with the means for exploring the delta by the U. S. revenue marine, represented by Capt. Healy of the Corwin, who had for some time contemplated an expedition for such a purpose.

The above facts being known to geographers, it was a matter for surprise, when, after his return, the newspapers, apparently by authority, claimed for Stoney the discovery of a new river of prodigious extent, which, in accordance with the unwritten law in such cases, he as discoverer was entitled to name. This supposition by those better informed was ascribed to imperfect charts; and it was supposed that the really important additions to geographical knowledge, made in the course of this exploration by Lieut. Stoney, entitled the hasty unofficial and unfounded claims on his behalf, so widely published, to the charity of silence. During the past season the explorations projected by Capt. Healy have been carried out by Lieut. Cantwell of the Revenue marine, not the less energetically, perhaps, from the fact that he was followed by a naval party in charge of Lieut. Stoney. Both parties have contributed largely to our knowledge of the hitherto unsurveyed river, and a comparison of the results of both will probably give a chart approximating nearly to accuracy. Meanwhile the western newspapers have published further accounts of Stoney's expedition, in which the claims of last year are repeated, together with others which may probably not appear in the official report when made. An abstract of this newspaper article, by an editorial oversight, appeared in *Science*, No. 95, without explanation or comment. We consider ourselves within the bounds of moderation when we say it is time that Lieut. Stoney protected his own reputation by emphatically disavowing claims on his behalf, which, by this time, he can but know are without a foundation in fact.

OUR NATURALISTS must have recognized the force of the remarks of Mr. P. L. Sclater before the American ornithologists' union, at its recent meeting, an account of which we published a few weeks ago, regarding the insufficient care taken of the valuable ornithological collections in this country. The same thing could be said concerning the older collections of insects forming so important a part of the history of the science of entomology in this country. It is a positive misfortune that the cabinets of the early naturalists, such as those of Say, Hentz, and Melsheimer, remained in this country; for almost without exception the specimens have been totally destroyed through neglect. There is not to-day more than a single museum in the country, where proper pro-

vision is made for the preservation of such perishable collections as dried specimens of insects. Under the present condition of things, it is actually unfortunate for the future of this science, when an enthusiast arises in some local museum whose care for and interest in these objects result in the accumulation of a considerable collection, often containing valuable types. At his death or removal, or possibly the failure to retain his early ardor, the chances are ten to one that the collection will be ultimately destroyed. Even our best endowed institutions have failed to make any proper provision for the preservation of their collections of insects and stuffed animals, —the two departments of a natural-history museum which require eternal vigilance.

There are many valuable entomological collections in the hands of specialists in this country, which would find their way by gift, or by sale on easy terms, to the National museum at Washington, were any reasonable inducement held out to them. These collections contain material especially valuable for the future of descriptive entomology in this country. Within a few years many such collections have been sold, either to other private collectors, or perhaps to parties out of the country, to find their place in European museums, where they are insured perpetual care. It is only within three years that there has been even a nominal curator in charge of the collection of insects at the National museum; and the paltry collection of the department of agriculture was all the authorities at the national capital had to show for an entire department of natural history, and one abounding in its wealth of varied forms. The present curator has but an honorary office, and is without funds for the support of an assistant. Until provision is made for the proper conduct of this immense department of natural history at the national capital, the appointment of an honorary curator is worse than useless. It only deceives those who know no better, into the supposition that collections sent to the museum are insured proper care. They are not.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Verification of predictions.

THE vulnerable point about Mr. Doolittle's measure of success (given under 'Proceedings of societies' in this number of *Science*) seems to me to be his combination of the two differences of probabilities, —

$$\frac{c}{o} - \frac{p-c}{s-o} \text{ and } \frac{c}{p} - \frac{o-c}{s-p}.$$

It appears clear to me that either of these differences may be taken alone, with perfect propriety, as the true measure, according as our concern is to test occurrences for successful prediction, or to test predictions for fulfilment. If we allow an importance n to the former test (limits of n, 0 and 1), so that an *ad valorem* change of δ in this measure produces an *ad valorem* change of $n\delta$ in i, and similarly an importance $1-n$ to the latter test, these two quantities will enter as exponents, and

$$i = \left(\frac{c}{o} - \frac{p-c}{s-o}\right)^n \left(\frac{c}{p} - \frac{o-c}{s-p}\right)^{1-n}.$$

In my opinion, the value of i is not discoverable unless the value of n is given; and this is a subjective quantity. Assuming $n = \frac{1}{2}$, we have for i an expression equal to the square root of that given by Mr. Doolittle, and without the fault of giving no negative values to answer to perverse predictions.

HENRY FARQUHAR.

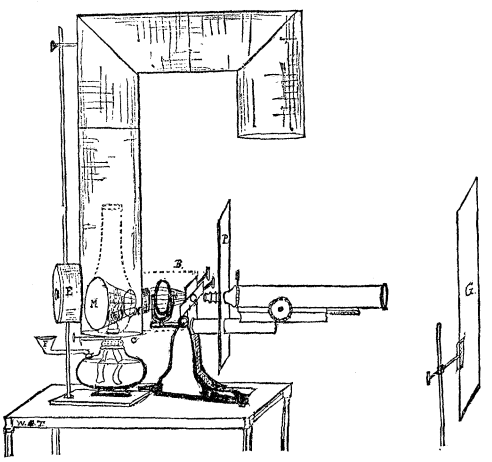
The microscope for class-room demonstration.

The following adaptation of the use of the microscope as a sort of magic-lantern for class demonstration has been found so extremely useful, cheap, and practical, that it is illustrated here.

A large common kerosene 'duplex' lamp is the illuminator. Superfluous light is cut off by a piece of six-inch stove-pipe, which fits over the lamp-chimney, and rests upon a horizontal collar, *C*, of stove-pipe metal. The collar prevents the pipe from shutting down too far upon the lamp, which would cause the kerosene to become dangerously hot. The lamp is filled at *F* with a curved glass funnel; and the two flat wicks, an inch and a half broad, are turned by their separate keys outside of the pipe. The pipe has two elbows, which conduct heat and smoke away, and completely cut off the light from the top of the flame. These elbows may be rotated into any convenient position. Opposite the lamp-chimney a third short elbow, *E*, is inserted, closed by a movable cap. Through this elbow the chimney can be removed, the wicks trimmed, and a concave glass or tin reflector, *M*, four inches and a half in diameter, may be placed behind the flame. The flat of the wicks should be parallel to this mirror. Opposite the mirror, and directly in front of the flame, a plano-convex lens, *X*, two inches in diameter, is inserted in a hole in the pipe. The light reflected from the mirror, *M*, passes through this lens, and falls upon the reflector of the microscope, whence it is made to illuminate the object upon the glass slide in the ordinary way. The object is magnified by a one-fifth inch or one-half inch objective; the eye-piece of the microscope is removed; and the image is projected upon a ground-glass screen, *G*, a foot and a half square, which is placed from one to four feet in front of the microscope. The screen is supported by a perpendicular iron rod and cork-lined clamp, such as is in use in every chemical

laboratory, to hold glass retorts, tubes, etc. The iron rod rests upon the floor, occupies very little space, and can be moved to any convenient focusing distance. A similar stand supports the horizontal elbow of the stove-pipe. The tube of the microscope should be blackened inside as in micro-photography. The microscope is handled in every way as usual in respect to stage movement, fine adjustment, etc.

The great difficulty with the apparatus consists in trying to prevent the reflection of superfluous light. To obviate this, a pasteboard box, *B*, six by six by eight inches, is readily cut to fit closely over the plano-convex lens and the back of the microscope stage, thus enclosing the microscope reflector, and allowing it room to be focused properly when the lid of the box is removed. It is also advisable to fit a sheet of pasteboard, *P*, tightly over the microscope tube at right angles to it, in order to cut off the rays which escape around the object illuminated, pass along the axis of vision outside of the tube, and tend to blur the image on the screen.



B, outline of paper box to enclose mirror; *C*, collar to support stove-pipe; *E*, elbow through which chimney may be removed; *F*, funnel for filling lamp; *G*, ground-glass screen; *M*, reflector inside of stove-pipe (posterior surface); *P*, pasteboard screen; *X*, hole in stove-pipe where lens is inserted.

Dr. J. West Roosevelt (to whom the larger part of the ingenuity of this apparatus is due) and the writer have for some time made constant use of it for instructing students. Physiological, histological, pathological, and botanical specimens may be clearly shown. A number of students can look on at once. The slides are rapidly changed, and students and instructor may always be sure that they are discussing the same particular cell; which, unfortunately, is not the case when a beginner in the use of the microscope looks through the instrument alone. The apparatus may readily be constructed by any one for about five dollars: it is easily portable, and always ready for use in any darkened room. It is possible to throw the light from the lens *X* directly upon the object without the intervention of the microscope reflector, but the reflector facilitates focusing. Objectives of wide aperture are preferable. With some lenses, the use of the eye-piece adds distinctness, but in most cases it cuts out too much light. An Abbe illuminator may be inserted. The image on the screen *G* is seen most distinctly upon the farther side; and some objects become clearer if the screen be moistened with water, or covered with a thin coat of transparent varnish laid over the ground surface. The image may also be received upon white glazed paper, but this is less clear.

For demonstration on a larger scale, an oxy-hydrogen light can of course be used, or some form of electric light. The arc-light is not sufficiently steady, and the incandescent light requires a great deal of storage-room for batteries. The light above described shines with thirty-six candle power, is clear and steady, and serves every ordinary purpose: the circulation in the frog's foot, varieties of epithelium, injected lung tissue, tubercle, plant-cells, etc., may all be clearly shown. The colors of stained or injected specimens come out distinctly.

The principle of this apparatus is by no means new; but its application is made so easily within the reach of any one who owns a microscope, that it is especially recommended to instructors in schools and colleges.

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25 West 26th Street, New York.

QUINTINO SELLA.

QUINTINO SELLA was born July 27, 1827, at Mosso Superiore, a little village on the Biellese mountains, and pursued his early studies at Biella, evincing a special aptitude for the classics. Later he completed a course of study in mathematics and physics at the Turin university, and obtained the degree of hydraulic engineer. He then entered the school of mines at Paris, and passed the following five years, partly in study, partly in travelling through Germany and England. His studies were much interrupted by the political excitement of 1848, and he was an interested witness of all the stirring events from the fall of Louis Philippe to the proclamation of the second empire. At Paris he made the acquaintance of Gastaldi, with whose co-operation he later founded the Valentino museum. After his return to his home in 1852, he would have entered the service of the royal corps of mining engineers; but Savoy being the only district vacant, and not being able, on account of private business and his somewhat impaired health, to reside there during the winter, he remained at Turin, where he became professor of geometry at the technical institute, and where he married Clotilde Rey. In June of the next year he went to Savoy, and remained till the autumn, when he was appointed temporarily professor of mathematics at the university of Turin. In 1856 he was admitted into the corps of mining engi-

neers, and was given charge of Turin district and the regency of that of Coni.

In 1859 he was made a member of the council of public instruction, and in 1860 of the council of mining engineers. Since 1856 he had had the care of the mineralogical cabinet of the technical institute, which later became the school of application, and where in 1860 he was appointed professor of mineralogy. Here his active scientific work ended. Sella's political career began in the following year, when he was elected representative of Cossato (Biellese), in which capacity he was serving at the time of his death. In the same year also he was general secretary of the minister of public instruction, and held the office for some time gratuitously. Three times he was the minister of finance, the first time in the Rattazzi cabinet, when he had had no experience in politics, and as the successor of Cavour. Then began that gigantic but successful struggle with the enormous debt of the Italian treasury which saved the national honor and fortune. To him also was largely due the construction of the Palazza dei finanze.

In 1873 he withdrew for an indefinite time from politics, and accepted the presidency of the Accademia scientifica dei lincei, and obtained its removal to the Corsini palace.

His mineralogical and geological publications were numerous. One of the most important of the former was his account of the mineralogical industry of Sardinia, in which he gave the general statistics and description of the mines and smelting-works of the island, with their technical and economical condition, and proposed a plan for their improvement, and in which he touched upon the important question of the ownership of mines. In 1881 he was made honorary president of the international geological congress; and at that time, in conjunction with Professor Capellini, he founded the Italian geological society. His principal geological work was his map of the Biellese district; and he was intending to make a detailed study of the Biellese Alps in the interests of geology. He was the founder and president of the Italian alpine club, and of his work in this branch much might be said.

So passed away, in his fifty-seventh year, a man the useful period of whose life, coinciding with that of the re-organization of Italy, contributed much to its formation. Italy was not unmindful of his services. Public funeral honors were granted him, parliament decreed a national monument at Rome, and various testimonials were offered by different cities and organizations, among which may be mentioned the medallion presented by the royal corps of mining engineers.

Our portrait represents him at the age of thirty-six.

THE NETSCHILLUK INNUITS.

THE Netschilluk Innuit, or Eskimo, have been variously spoken of as Neitschilluk, Netschillee, Nachillee, and Nachilluk, by various writers. The name comes from Netshuk, or Neitschuk, meaning the small seal of the Arctic, and is no doubt due to their being dependent upon the seal as their staple article of food. So important a factor is the stomach of the Eskimo, in his economy, that his diet often determines his tribal name; but the significance of the name has in many cases vanished, either on account of tribal migration, or the extinction of the animals upon which they were dependent.

I found the Netschilluks, in 1879, living on the mainland opposite King William's Land, and along the islands in the vicinity of Simpson's Strait. They were most numerous along the northern shores of Adelaide Peninsula, their villages being scattered every few miles along this coast from the Montreal Islands to Smith's Point. Farther east were the Pelly Bay Eskimo, with whom the Netschilluks get along well enough, and through whose country some have migrated to Hudson's Bay. To the southeast were the Oogueesik Salik Innuit, a nearly extinct tribe, the few remaining members living at the Dangerous Rapids of Back's River, and Salmon Rapids of Hayes River. Between them and the Netschilluk, there exists the deepest distrust. From Smith's Point to Maclaughlin Bay, along the western shore of Adelaide Peninsula and in King-mik-took (Dogs' Inlet), there live the Ookjoolik, or Oojooklik, with whom the Netschilluks are intimately associated. Still farther west are the Kidnelik (copper Eskimo); and between them and all the other tribes I have mentioned, there exists open hostility, — the only case I know among the whole family of Eskimo. This hostility, however, takes more the form of strenuous efforts to avoid each other, than to bring on collisions, though occasionally such do occur.

The Netschilluks, in weight and stature, are above the Caucasian race. The Eskimo of Greenland have been so often described, and are generally so undersized, that this characteristic has unwittingly been attributed to the whole race. Among the Eskimo of North Hudson's Bay I occasionally found a man of even conspicuous size. One of these was the only fully grown Netschilluk on the shore of the bay; and I determined to have him in my sledging-party for King William's Land, as he would be a letter of introduction. He was named Ikgueesik, stood about six feet high, and weighed perhaps from two hundred and twenty to two hundred and thirty pounds, every ounce apparently serviceable muscle. He proved to be a by no means exceptional specimen of his race, one whom I met standing over six feet six inches. Those of shorter stature were of exceedingly heavy build, with stout frames and broad shoulders. A cadaverous-looking specimen (fig. 1), whom we met for the first time as

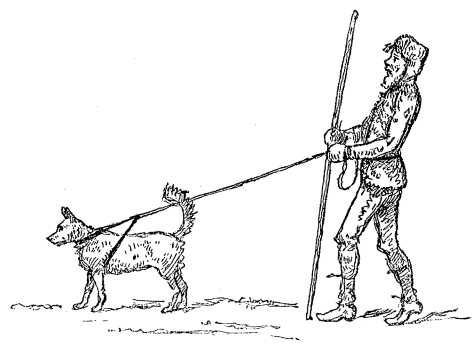


FIG. 1.

we were leaving his country in November, could hardly be called an exception, when his story is told. As soon as the ice in the fresh-water lakes is melted in July, this tribe leaves the coast to hunt reindeer. Our friend, having chosen a very unfrequented sheet of water for his summer reindeer-hunt, was left one day upon an island with his kiak wrecked, and, when rescued many days after, was at the point of death from starvation. He was brought to the coast in the fall, and when we saw him, although unable to walk alone, had overcome this difficulty by harnessing a strong dog, and tying the trace around his waist, and, with a long cane or staff, could make good headway as a pedestrian.

The Netschilluks know nothing of fire-arms. Their bows are made of spliced pieces of musk-ox horn or driftwood, and cannot compare with those of the American Indians. Their method of hunting reindeer is to build a line of stone monuments (fig. 2) of about a man's size, from fifty to a hundred yards apart, on some ridge often two or three miles in length, which runs obliquely (fig. 3) toward some large lake or wide river. If a herd of reindeer is seen between the line of cairns and the water, the natives deploy into a skirmish line across from the last cairn to the river, and walk slowly toward the reindeer, their weapons and their kiaks being concealed near the water's edge.

The reindeer, seeing their enemy, trot away until they come within sight of the piles of stones, when, believing themselves to be sur-

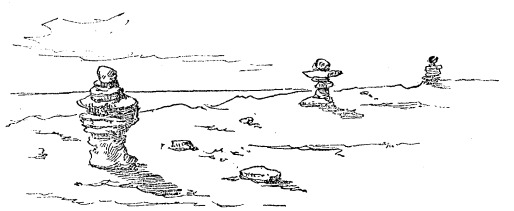


FIG. 2.

rounded, they take to the water. Then the Innuit follow in their kiaks, and easily overtake the bewildered animals. A herd of reindeer, when undisturbed, will repeatedly graze near such a line of cairns without any further notice than a few suspicious glances.

Depending as they do upon such a precarious chase, the Netschilluks are poorly clothed. As they live nearest to the pole of minimum temperature, it is interesting to note their methods of combating the cold. Their igloos are the warmest I saw in the Arctic: they are very low, as shown in fig. 4, the dotted lines indicating the usual height. With such a cramped space, the heat from the lamp and

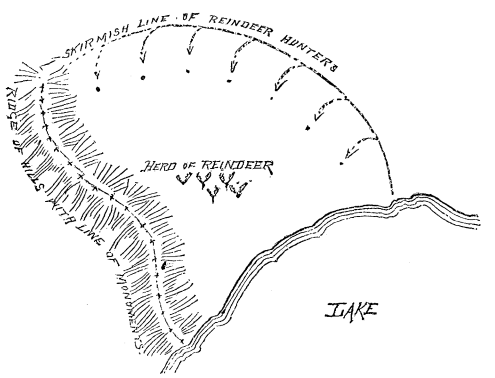


FIG. 3.

from the bodies of the Innuit is naturally economized to the utmost.

They have an unlimited supply of seal and ookjook (great seal) oil for lamp-use, while they devour enormous quantities of seal-blubber. Their consumption of fat, even during the summer and autumn months, when I saw them, was noticeably greater than that of other tribes. Their reputation for thieving is not conspicuous, and they generally tell the truth. They treat their children well, especially the boys, but still practise to a limited degree female infanticide. They have the usual superstitious beliefs of savages, but are to be credited with having devised a physical theory to account for a physical phenomenon. They never have seen wood growing, and only know it as driftwood scattered on the shore. They see the logs frozen in the ice before they are cast upon the shore, and believe the timber to be a growth on the bottom of the ocean (fig. 5), which, when it reaches to a certain height, is nipped off by the ice, and borne to the land. It was on one of their wood-seeking trips that the Netschilluks learned so much regarding the ill-fated Franklin party. These trips are at rare intervals; and wood enough is secured to

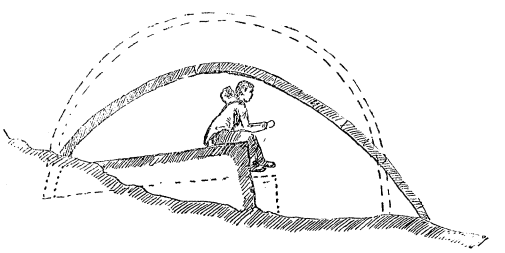


FIG. 4.

last for five or ten years, as this part of the country is almost destitute of game.

The Netschilluks' fear of their western neighbors was well illustrated by their reception of our party. As soon as they discovered us approaching, the women and children withdrew to the snow-huts, while the men formed in line with drawn bows, one arrow fixed, and the whole quiver brought around in convenient position for the use of the others. At my guide's request, I fired a gun in the air to show them that we were white men: this seemed to frighten them more than ever. At last an old woman was sent forward to meet Ikgueesik, whom I had directed to go toward them; and

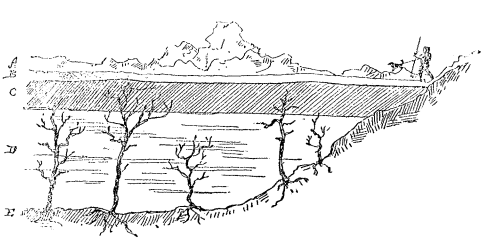


FIG. 5.

the poor old hag came forward, trembling, with a perfect bewilderment of volubility to strengthen her fast-failing courage.

In their marriage relations I found but little difference from those of Eskimo better known. The marriage contract is arranged early in life by the parents, although Ikgueesik bought a wife for his nearly grown brother, who was also of my party, for the consideration of a whaler's jack-knife.

Their pugilistic encounters generally take place between the 'best men' of different villages, and especially of different tribes, so that all my Eskimo were promptly challenged; but being feather weights, compared with these giants, I interfered. Their fights are managed somewhat in this way: one of the combatants, sitting or standing, leans forward with both hands or elbows resting on his knees, when his opponent, with clinched fist, deals him such a blow on the side of the head as he may see fit, the first stroke being usually comparatively light. No. 2 then takes his turn in leaning forward, and No. 1 deals him a blow, generally a little heavier than that he has just received. This operation goes on until one or the other is either knocked senseless, or rendered helpless from sheer exhaustion.

Another danger threatening the natives of my party was no less than the undertaking to assassinate one of them, or possibly a white man, should circumstances favor. Family feuds are not unfrequent; and, when a death results, every male relative of the murdered man feels bound to avenge the death by killing some man of the offending tribe, the murderer or some near relative being preferable. This vengeance may be postponed almost indefinitely, and friendly social relations maintained; but, slow as it is, it is sure to come, sooner or later.

I have known one of these murderers to coolly take up his residence among his enemies, and to all intents and purposes be as one of them. Among the Netschilluks at the last camp we visited was a powerfully built specimen of his tribe, Toolooah by name. Many years before, — so many that he could not count them on his fingers, and therefore could not tell how many, — a relative of his had fallen a victim at the hands of an Iwillik, and had not yet been avenged. Although there was not an Iwillik among us, still my own Eskimo felt that any of us might fall to atone for this ancient crime. They told me that they felt satisfied that many of the natives who watched our sledge-loading the morning we left had long knives secreted in their sleeves, should they need to defend the Netschilluk Toolooah, who still persisted in his idea of revenge, should opportunity offer. But the sight of our many and wonderful weapons frightened him into a peaceful attitude. Singularly, these feuds never swell into tribal wars. FREDERICK SCHWATKA.

HOW THE PROBLEMS OF AMERICAN ANTHROPOLOGY PRESENT THEMSELVES TO THE ENGLISH MIND.[1]

I HAVE seldom, ladies and gentlemen, felt myself in a more difficult position than I do at this moment. Yesterday morning, when we returned from an expedition out into the far west, — an expedition which your president was to have joined, but which, to our great regret, he was obliged to give up, — I heard that at this meeting of the Anthropological society of Washington I should be called upon to make, not merely a five-minutes' speech, but a substantive address; and since that time my mind has been almost entirely full of the new things that I have been seeing and hearing in the domain of anthropology in this city. I have been seeing the working of that unexampled institution, the Bureau of ethnology, and studying the collections which, in connection with the Smithsonian institution, have been brought in from the most distant quarters of the continent; and after that, in odd moments, I have turned it over in my mind, What can I possibly say to the Anthropological society when I am called upon to face them at thirty-six hours' notice? I will not apologize: I will do the best I can.

I quite understand that Major Powell, who is a man who generally has a good reason for every thing that he does, had a good reason for desiring that an anthropologist from England should say something as to the present state of the new and growing science in England as compared with its condition in America, — for believing that some communication would be acceptable between the old country and the new, upon a subject where the inhabitants of both have so much interest in common, and can render to one another so much service in the direction of their work. And therefore I take it that I am to say before you this evening, without elaborate oratory and without even careful language, how the problems of American anthropology present themselves to the English mind.

Now, one of the things that has struck me most in America, from the anthropological point of view, is a certain element of old-fashionedness. I mean old-fashionedness in the strictest sense of the word, — an old-fashionedness which goes back to the time of the colonization of America. Since the Stuart time, though America, on the whole, has become a country of most rapid progress in development as compared with other districts of the world, there has prevailed in certain parts of it a conservatism of even an intense character. In districts of the older states, away from the centres of population, things that are old-fashioned to modern Europe have held their

[1] A lecture delivered by Dr. EDWARD B. TYLOR before the Anthropological society of Washington, Oct. 11, 1884.

own with a tenacity somewhat surprising. If I ever become possessed of a spinning-wheel, an article of furniture now scarce in England, I can hardly get a specimen better than in Pennsylvania, where 'my great-grandmother's spinning-wheel' is shown — standing, perhaps in the lumber-room, perhaps in an ornamental place in the drawing-room — oftener than in any other country that I ever visited.

In another respect Pennsylvania has shown itself to me fruitful of old-fashioned products. I was brought up among the Quakers, — like so many, I dare say, who are present; for the number of times in the week, or even in the day, in which it occurs that those whom one meets prove to be at least of Quaker descent, represents a proportion which must be highly pleasant to the Quaker mind. In the history of the Society of the Friends, there has recently come out a fact unknown, especially to the Friends themselves. Their opinion has always been that they came into existence in the neighborhood of 1600, by spontaneous generation, in an outburst of spiritual development in England. It has now been shown, especially by the researches of Robert Barclay (not the old controversialist, but a modern historian), that the Quakers were by no means the absolutely independent creation that they and others had supposed them to be; that they were derived from earlier existing denominations by a process which is strictly that of development. Their especial ancestors, so to speak, were a division of the early Dutch sect known as Mennonites. The Friends have undergone much modification as to theological doctrine; but some of their most pronounced characteristics, such as the objection to war and oaths, and even details of costume, and the silent grace before meals, remain as proofs of Mennonite derivation. To find the Mennonites least changed from their original condition is now less easy in their old homes in Europe than in their adopted homes in the United States and Canada, whither they have migrated from time to time, up till quite recently, in order to avoid being compelled to serve as soldiers. They have long been a large and prosperous body back in Pennsylvania. I went to see them; and they are a very striking instance of permanency of institutions, where an institution or a state of society can get into prosperous conditions in a secluded place, cut off from easy access of the world. Among them are those who dissent from modern alteration and changes by a fixed and unalterable resolution that they will not wear buttons, but will fasten their coats with hooks and eyes, as their forefathers did. And in this way they show with what tenacity custom holds when it has become matter of scruple and religious sanction. Others have conformed more and more to the world; and most of those whom I have seen were gradually conforming in their dress and habits, and showing symptoms of melting into the general population. But, in the mean time, America does offer the spectacle of a phase of religious life, which, though dwindling away in the old-world region where it arose, is quite well preserved in this newer country, for the edification of students of culture. These people, who show such plain traces of connection with the historical Anabaptists that they may be taken as their living representatives, still commemorate in their hymns their martyrs who fell in Switzerland for the Anabaptist faith. There was given me only a few days ago a copy of an old scarce hymn-book, anterior to 1600, but still in use, in which is a hymn commemorative of the martyr Haslibach, beheaded for refusing to conform to the state religion, whose head laughed when it was cut off.

Now, to find thus, in a secluded district, an old state of society resisting for a time the modifying influences which have already changed the world around, is no exceptional state of things. It shows the very processes of resisted but eventually prevailing alteration which anthropologists have to study over larger regions of space and time in the general development of the world. In visiting my Mennonite friends in Pennsylvania, I sometimes noticed, that, while they thought it nothing strange that I should come to study them and their history, yet when I was asked where I was going next, and confessed with some modesty that I was going with Major Powell to the far west to see the Zuñis, this confession on my part was received with a look of amazement, not quite unmingled with kindly reproof: it seemed so strange to my friends that any person travelling about of his own will should deliberately go to look at Indians. I found it hard to refrain from pointing out, that, after all, there is a community of purpose between studies of the course of civilization, whether carried out among the colonists of Pennsylvania or among the Indians of New Mexico. Investigation of the lower races is made more obscure and difficult through the absence of the guidance of written history, but the principle is the same.

A glance at the tribes whom Professor Moseley and I have seen in the far west during the last few weeks has shown one or two results which may be worth stating; and one, merely parenthetical, I think I must take leave to mention, though it lies outside the main current of my subject.

Our look at North-American Indians, of whom it has been my lot to write a good deal upon second-hand evidence, had, I am glad to say, a very encouraging effect; because it showed, that on the whole, much as the writings of old travellers and missionaries have to be criticised, yet if, when carefully compared, they agree in a statement, personal inspection will generally verify that statement. One result of our visit has been, not a diminution, but an increase, of the confidence with which both of us in future will receive the statements of travellers among the Indians, allowing for their often being based upon superficial observation. So long as we confine ourselves to things which the traveller says he saw and heard, we are, I believe, upon very solid ground.

To turn to our actual experiences. The things that one sees among the Indian tribes who have not become so 'white' as the Algonkins and the Iroquois, but who present a more genuine picture of old American life, do often, and in the most vivid way,

present traces of the same phenomena with which one is so familiar in old-world life. Imagine us sitting in a house just inside California, engaged in what appeared to be a fruitless endeavor on the part of Professor Moseley to obtain a lock of hair of a Mojave to add to his collection. The man objected utterly. He shook his head. When pressed, he gesticulated and talked. No: if he gave up that bit of hair, he would become deaf, dumb, grow mad; and, when the medicine-man came to drive away the malady, it would be of no use, he would have to die. Now, all this represents a perfectly old-world group of ideas. If you tried to get a lock of hair in Italy or Spain, you might be met with precisely the same resistance; and you would find that the reason would be absolutely the same as that which the Mojave expressed, — that by means of that lock of hair one can be bewitched, the consequence being disease. And within the civilized world the old philosophy which accounts for disease in general as the intrusion of a malignant spirit still largely remains; and the exorcising such a demon is practised by white men as a religious rite, even including the act of exsufflating it, or blowing it away, which our Mojave Indian illustrated by the gesture of blowing away an imaginary spirit, and which is well known as forming a part of the religious rites of both the Greek and Roman church. How is it that such correspondence with old-world ceremonies should be found among a tribe like the Mojaves, apparently Mongolian people, though separated geographically from the Mongolians of Asia? Why does the civilization, the general state of culture, of the world, present throughout its whole range, in time and space, phenomena so wonderfully similar and uniform? This question is easy to ask; but it is the question, which, in few words, presents the problem which, to all anthropologists who occupy themselves with the history of culture, is a problem full of the most extreme difficulty, upon which they will have for years to work, collecting and classifying facts, in the hope that at some time the lucky touch will be made which will disclose the answer. At present there is none of an absolute character. There is no day in my life, when I am able to occupy myself with anthropological work, in which my mind does not swing like a pendulum between the two great possible answers to this question. Have the descendants of a small group of mankind gone on teaching their children the same set of ideas, carrying them on from generation to generation, from age to age, so that when they are found in distant regions, among tribes which have become different even in bodily formation, they represent the long-inherited traditions of a common ancestry? Or is it that all over the world, man, being substantially similar in mind, has again and again, under similar circumstances of life, developed similar groups of ideas and customs? I cannot, I think, use the opportunity of standing at this table more profitably than by insisting, in the strongest manner which I can find words to express, on the fundamental importance of directing attention to this great problem, the solution of which will alone bring the study of civilization into its full development as a science.

Let me put before you two or three cases, from examples which have been brought under my notice within the last few days, as illustrating the ways in which this problem comes before us in all its difficulty.

This morning, being in the museum with Major Powell, Professor Moseley, and Mr. Holmes, looking at the products of Indian life in the far west, my attention was called to certain curious instruments hanging together in a case in which musical instruments are contained. These consisted simply of flat, oblong, or oval pieces of wood, fastened at the end to a thong, so as to be whirled round and round, causing a whirring or roaring noise. The instruments in question came, one from the Ute Indians, and one from the Zuñis. Now, if an Australian, finding himself inspecting the National museum, happened to stand in front of the case in question, he would stop with feelings not only of surprise, but probably of horror; for this is an instrument which to him represents, more intensely than any thing else, a sense of mystery attached to his own most important religious ceremonies, especially those of the initiation of youths to the privileges of manhood, where an instrument quite similar in nature is used for the purpose of warning off women and children. If this Australian were from the south, near Bass Strait, his native law is, that, if any woman sees these instruments, she ought immediately to be put to death; and the illustration which he would give is, that, in old times, Tasmania and Australia formed one continent, but that one unlucky day it so happened that certain boys found one of these instruments hidden in the bush, and showed it to their mothers, whereupon the sea burst up through the land in a deluge, which never entirely subsided, but still remains to separate Van Dieman's Land from Australia. And, even if a Caffre from South Africa were to visit the collection, his attention would be drawn to the same instruments, and he would be able to tell that in his country they were used for the purpose of making loud sounds, and warning the women from the ceremonies attending the initiation of boys. How different the races and languages of Australia and Africa! yet we have the same use cropping out in connection with the same instrument; and, to complete its history, it must be added that there are passages of Greek literature which show pretty plainly that an instrument quite similar was used in the mysteries of Bacchus. The last point is, that it is a toy well known to country-people, both in Germany and in England. Its English name is the 'bull-roarer;' and, when the children play with it in country villages, it is hardly possible (as I know by experience) to distinguish its sound from the bellowing of an angry bull.

In endeavoring to ascertain whether the occurrence of the 'bull-roarer' in so many regions is to be explained by historical connection, or by independent development, we have to take into consideration, first, that it is an apparatus so simple as possibly to have been found out many times; next,

that its power of emitting a sound audible at a great distance would suggest to Australians and Caffres alike its usefulness at religious ceremonies from which it was desired to exclude certain persons. Then we are led to another argument, into which I will not enter now, as to the question why women are excluded in the most rigid manner from certain ceremonies. But in any event, if we work it out as a mere question of probabilities, the hypothesis of repeated reinvention under like circumstances can hold its own against the hypothesis of historical connection; but which explanation is the true one, or whether both are partly true, I have no sufficient means to decide. Such questions as these being around us in every direction, there are only two or three ways known to me in which at present students can attack them with any reasonable prospect of success. May I briefly try to state, not so much by precept as by example, what the working of those methods is by which it is possible, at any rate, to make some encroachments upon the great unsolved problem of anthropology?

One of the ways in which it is possible to deal with such a group of facts may be called the argument from outlandishness. When a circumstance is so uncommon as to excite surprise, and to lead one to think with wonder why it should have come into existence, and when that thing appears in two different districts, we have more ground for saying that there is a certain historical connection between the two cases of its appearance than in the comparison of more commonplace matters. Only this morning a case in point was brought rather strongly under my notice; not that the facts were unknown, for we have been seeing them for days past at Zuñi. The Indians of the north, and especially the Iroquois, were, as we know, apt to express their ideas by picture-writings, in the detailed study of which Col. Mallery is now engaged. One sign which habitually occurs is the picture of an animal in which a line is drawn from the throat, through the picture of the animal, terminating in the heart. Now, the North-American Indians of the lake district have a distinct meaning attached to this peculiar heart-line, which does not attach to ordinary pictures of animals: they mean some animal which is living, and whose life is affected in some way by a charm of some kind.

It is expressly stated by Schoolcraft that a picture he gives of a wolf with such a heart-line means a wolf with a charmed heart. It is very remarkable to find, among the Zuñis, representations of deer and other animals drawn in the same manner; and the natural inference is, that the magic of the Iroquois and the Zuñis is connected, and of more or less common origin. I verified this supposition by asking Mr. Cushing, our authority on Zuñi language and ideas, what idea was generally attached to this well-known symbol; and his answer was, that it indicated a living animal on which magical influence was being exerted. May we not, then, consider, — leaving out of the question the point whether the Pueblo people invented the heart-line as a piece of their magic and the nomad tribes of the north picked it up from them, or whether it came down from the northern tribes and was adopted by the southern, or whether both had it from a common source, — that, at any rate, there is some ground, upon the score of mere outlandishness, for supposing that such an idea could not occur without there being some educational connection between the two groups of tribes possessing it, and who could hardly have taken it by independent development?

To mention an instance of the opposite kind: I bought a few days ago, among the Mojaves, a singular article of dress, — a native woman's girdle, with its long fringe of twisted bark. This, or rather two of these put on so as to form one complete skirt, used to be her only garment; and it is still worn from old custom, but now covered by a petticoat of cotton, generally made of several pocket-handkerchiefs in the piece, bought from the traders. Under these circumstances, it has become useless as a garment, only serving as what I understand is called in the civilized world a 'dress-improver;' the effect of which, indeed, the Mojave women perfectly understand, and avail themselves of in the most comic manner. Suppose, now, that we had no record of how this fantastic fashion came into use among them: it has only to be compared with the actual wearing of bark garments in Further Asia and the Pacific Islands in order to tell its own history, — that it is a remnant of the phase of culture where bark is the ordinary material for clothing. But the anthropologist could not be justified in arguing from this bark-wearing that the ancestors of the Mojaves had learned it from Asiatics. Independent development, acting not only where men's minds, but their circumstances, are similar, must be credited with much of the similarity of customs. It is curious that the best illustrations of this do not come from customs which are alike in detail in two places, and so may be accounted for, like the last example, by emigration from one place to another. We find it much easier to deal with practices similar enough to show corresponding workings of the human mind, but also different enough to show separate formation. Only this morning I met with an excellent instance of this. Dr. Yarrow, your authority on the subject of funeral rites, described to me a custom of the Utes of disposing of the bodies of men they feared and hated by putting them under water in streams. After much inquiry, he found that the intention of this proceeding was to prevent their coming back to molest the survivors. Now, there is a passage in an old writer on West Africa where it is related, that, when a man died, his widow would have herself ducked in the river in order to get rid of his ghost, which would be hanging about her, especially if she were one of his most loved wives. Having thus drowned him off, she was free to marry again. Here, then, is the idea that water is impassable to spirits, worked out in different ways in Africa and America, but showing in both the same principle; which, indeed, is manifested by so many peoples in the idea of bridges for the dead to pass real or imaginary streams, from the threads stretched across brooks in Burmah for the souls of friends to cross by, to Catlin's slippery pine-log for

the Choctaw dead to pass the dreadful river. In such correspondences of principle we trace, more clearly than in mere repetitions of a custom or belief, the community of human intellect.

But I must not turn these remarks into what, under ordinary circumstances, would be a lecture. I have been compelled to address myself, not so much to the statement in broad terms of general principles, as to points of detail of this kind, because it is almost impossible, in the present state of anthropology, to work by abstract terms; and the best way of elucidating a working-principle is to discuss some actual case. There are now two or three practical points on which I may be allowed to say a few words.

The principle of development in civilization, which represents one side of the great problem I have been speaking of, is now beginning to receive especial cultivation in England. While most museums have been at work, simply collecting objects and implements, the museum of Gen. Pitt-Rivers, now about to be removed from London to Oxford, is entirely devoted to the working-out of the development theory on a scale hardly attempted hitherto. In this museum are collected specimens of weapons and implements, so as to ascertain by what steps they may be considered to have arisen among mankind, and to arrange them in consecutive series. Development, however, is not always progress, but may work itself out into lines of degeneration. There are certain states of society in which the going-down of arts and sciences is as inevitable a state of things as progress is in the more fortunate regions in which we live. Anthropologists will watch with the greatest interest what effect this museum of development will have upon their science. Gen. Pitt-Rivers was led into the formation of the remarkable collection in question in an interesting manner. He did not begin life either as an evolutionist or as an anthropologist. He was a soldier. His business, at a particular time of his life, was to serve on a committee on small-arms, appointed to reform the armament of the British army, which at that time was to a great extent only provided with the most untruthful of percussion-muskets. He then found that a rifle was an instrument of gradual growth; for the new rifles which it was his duty to inspect had not come into existence at once and independently. When he came to look carefully into the history of his subject, it appeared that some one had improved the lock, then some one the rifling, and then others had made further improvements; and this process had gone on, until at last there came into existence a gun, which, thus perfected, was able to hold its own in a permanent form. He collected the intermediate stages through which a good rifle arose out of a bad one; and the idea began to cross his mind that the course of change which happened to rifles was very much what ordinarily happens with other things. So he set about collecting, and filled his house from the cellar to the attic, hanging on his walls series of all kinds of weapons and other instruments which seemed to him to form links in a great chain of development. The principle that thus became visible to him in weapon-development is not less true through the whole range of civilization; and we shall soon be able to show to every anthropologist who visits Oxford the results of that attempt. And when the development theory is seen in that way, explaining the nature and origin of our actual arts and customs and ideas, and their gradual growth from ruder and earlier states of culture, then anthropology will come before the public mind as a new means of practical instruction in life.

Speaking of this aspect of anthropology leads me to say a word on another hardly less important. On my first visit to this country, nearly thirty years ago, I made a journey in Mexico with the late Henry Christy, a man who impressed his personality very deeply on the science of man. He was led into this subject by his connection with Dr. Hodgkin; the two being at first interested, from the philanthropist's point of view, in the preservation of the less favored races of man, and taking part in a society for this purpose, known as the Aborigines' protection society. The observation of the indigenous tribes for philanthropic reasons brought the fact into view that such peoples of low culture were in themselves of the highest interest as illustrating the whole problem of stages of civilization; and this brought about the eatablishment of the Ethnological society in England, Henry Christy's connection with which originated his plan of forming an ethnological museum. The foundations of the now celebrated Christy collection were laid on our Mexican journey; and I was witness to his extraordinary power of knowing, untaught, what it was the business of an anthropologist to collect, and what to leave uncollected; how very useless for anthropologic purposes mere curiosities are, and how priceless are every-day things. The two principles which tend most to the successful work of anthropology — the systematic collection of the products of each stage of civilization, and the arrangement of their sequence in development — are thus the leading motives of our two great anthropological museums.

To my mind, one of the most remarkable things I have seen in this country is the working of the Bureau of ethnology as part of the general working of the government department to which it belongs. It is not for me, on this occasion, to describe the working of the Smithsonian institution, with its research and publication extending almost through the whole realm of science; nor to speak of the services of that eminent investigator and organizer, Prof. Spencer F. Baird. It is the department occupied with the science of man of which I have experience; and I do not think that anywhere else in the world such an official body of skilled anthropologists, each knowing his own special work, and devoted to it, can be paralleled. The Bureau of ethnology is at present devoting itself especially to the working-up of the United States, and to the American continent in general, but not neglecting other parts of the world. And I must say that I have seen with the utmost interest the manner in which the central organism of the Bureau of ethnology is performing the functions of an amasser and collector of all that is worth

knowing; how Major Powell is not only a great explorer and worker himself, but has the art of infusing his energy and enthusiastic spirit through the branches of an institution which stands almost alone, being, on the one hand, an institution doing the work of a scientific society, and, on the other hand, an institution doing that work with the power and leverage of a government department. If we talked of working a government institution in England for the progress of anthropology in the way in which it is being done here, we should be met with — silence, or a civil answer, but with no practical result; and any one venturing to make the suggestion might run the risk of being classed with that large body described here as 'cranks.' The only way in which the question can be settled, how far a government may take up scientific research as a part of its legitimate functions, is by practical experiment; and somehow or other your president is engaged in getting that experiment tried, with an obvious success, which may have a great effect. If in future a proposition to ask for more government aid for anthropology is met with a reply that such ideas are fanatical, and that such schemes will produce no good results, we have a very good rejoinder in Washington. The energy with which the Bureau of ethnology works throughout its distant ramifications has been a matter of great interest. It is something like what one used to hear of the organization of the Jesuits, with their central authority in a room in a Roman palace, whence directions were sent out which there was some agent in every country town ready to carry out with skill and zeal. For instance: it was interesting at Zuñi to follow the way in which Col. and Mrs. Stevenson were working the pueblo, trading for specimens, and bringing together all that was most valuable and interesting in tracing the history of that remarkable people. Both managed to identify themselves with the Indian life. And one thing I particularly noticed was this, that to get at the confidence of a tribe, the man of the house, though he can do a great deal, cannot do all. If his wife sympathizes with his work, and is able to do it, really half of the work of investigation seems to me to fall to her, so much is to be learned through the women of the tribe, which the men will not readily disclose. The experience seemed to me a lesson to anthropologists not to sound the 'bull-roarer,' and warn the ladies off from their proceedings, but rather to avail themselves thankfully of their help.

Only one word more, and I will close. Years ago, when I first knew the position occupied by anthropology, this position was far inferior to that which it now holds. It was deemed, indeed, curious and amusing; and travellers had even, in an informal way, shown human nature as displayed among out-of-the-way tribes to be an instructive study. But one of the last things thought of in the early days of anthropology, was that it should be of any practical use. The effect of a few years' work all over the world shows that it is not only to be an interesting theoretical science, but that it is to be an agent in altering the actual state of arts and beliefs and institutions in the world. For instance: look at the arguments on communism in the tenure of land in the hands of a writer who thinks how good it would be if every man always had his share of the land. The ideas and mental workings of such a philosopher are quite different from those of an anthropologist, who knows land-communism as an old and still existing institution of the world, and can see exactly how, after the experience of ages, its disadvantages have been found to outweigh its advantages, so that it tends to fall out of use. In any new legislation on land, the information thus to be given by anthropology must take its place as an important factor.

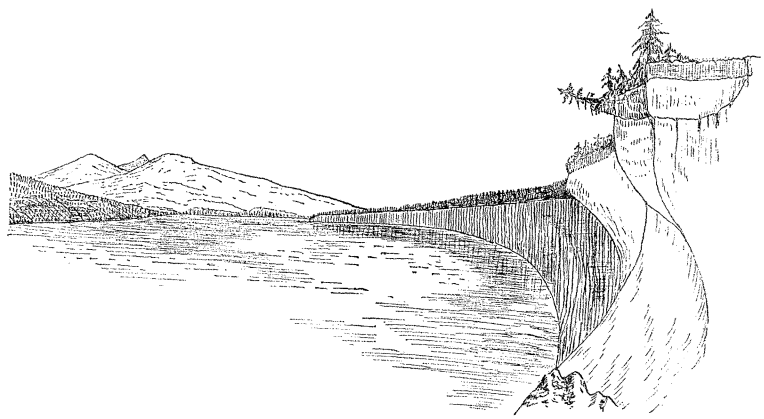
Again: when long ago I began to collect materials about old customs, nothing was farther from my thoughts than the idea that they would be useful. By and by it did become visible, that to show that a custom or institution which belonged to an early state of civilization had lasted on by mere conservatism into a newer civilization, to which it is unsuited, would somehow affect the public mind as to the question whether this custom or institution should be kept up, or done away with. Nothing has for months past given me more unfeigned delight than when I saw in the *Times* newspaper the corporation of the city of London spoken of as a 'survival.' You have institutions even here which have outlived their original place and purpose; and indeed it is evident, that, when the course of civilization is thoroughly worked out from beginning to end, the description of it from beginning to end will have a very practical effect upon the domain of practical politics. Politicians have, it is true, little idea of this as yet. But it already imposes upon bodies like this anthropological society a burden of responsibility which was not at first thought of. We may hope, however, that, under such leaders as we have here, the science of anthropology will be worked purely for its own sake; for, the moment that anthropologists take to cultivating their science as a party-weapon in politics and religion, this will vitiate their reasonings and arguments, and spoil the scientific character of their work. I have seen in England bad results follow from a premature attempt to work anthropology on such controversial lines, and can say that such an attempt is not only in the long-run harmful to the effect of anthropology in the world, but disastrous to its immediate position. My recommendation to students is to go right forward, like a horse in blinkers, neither looking to the right hand nor to the left. Let us do our own work with a simple intention to find out what the principles and courses of events have been in the world, to collect all the facts, to work out all the inferences, to reduce the whole into a science; and then let practical life take it and make the best it can of it. In this way the science of man, accepted as an arbiter, not by a party only, but by the public judgment, will have soonest and most permanently its due effect on the habits and laws and thoughts of mankind.

I am afraid I have not used well, under such short and difficult conditions, the opportunity which you have done me the great pleasure and honor of giving

me here. I have tried, as I said I would, to put in the simplest way before you some considerations which appear to me as of present importance in our science, both in the old world and in the new, and I thank you in the heartiest way possible for the opportunity you have given me to do this.

EXPLORATION OF THE KOWAK RIVER.

WE have been favored by Major E. W. Clark, chief of the Revenue marine bureau, with the following abstract of explorations on the Kowak or Kuak River of Alaska, made during the season of 1884 by a party from the U. S. steamer Corwin, Capt. Healy. The party comprised Lieut. J. C. Cantwell, commanding, assisted by Second-Assistant Engineer S. B. McLenegan, a quartermaster, fireman, miner, and interpreter, and was furnished with two small boats and the Corwin's steam-launch. They left the Corwin at Cape Krusenstern, July 8, and the following morning entered Hotham Inlet by a practicable channel four or five fathoms deep, which enters the inlet close to its eastern point or headland. The eastern and southern shores of the inlet are composed of clay bluffs about two hundred feet high, backed by rolling tundra. The opposite shore, however, was low and swampy, with many lagoons, the native guide stating that this was the Kowak delta, which has fifteen mouths, and extends some fifty miles inland. The temperature at this time averaged 80° or 90° F. during the day. At seven o'clock on the 10th of July a break was seen in the lowland of the delta, where a high peak ahead and a high bluff point on the western shore form a range for the channel entering the river. The channel is about two hundred yards wide, with two and a half fathoms least water at the time the party entered. The banks are low and marshy, with a dense growth of willow and birch, and harbored myriads of mosquitoes. At ten A.M. next day a collection of Innuit huts was seen, tenanted by only one family at that date. The banks of the river, hitherto uniformly low, began to be more elevated, and the current increased to three miles per hour. The course of the river was extremely tortuous. Another village was seen on the left bank, on a high black bluff, at four P.M. The depth of the river increased to five fathoms: its width varied, being from half to three-quarters of a mile. Many offshoots of the main stream were noticed, all extending to the northward and westward. The following day a good growth of pine, birch, and willow adorned the banks, which had previously shown only shrubbery. At half-past eight A.M. a large westerly arm was passed, which, according to the native guide, was the last arm of the delta, and flowed into the western part of Hotham Inlet. At noon the party obtained observations, placing them in latitude 68° 45′.3, and west longitude 161° 46′. At half-past two P.M. a series of ice-cliffs, like those of Eschscholtz Bay, was observed, composed of a solid mass of ice extending three-quarters of a mile along the left bank, covered by a thin layer of dark-colored earth, and rising to a height of a hundred and fifty feet. Trees were growing on the surface. Up to this point, and for some distance farther, not a single stone or pebble was to be seen, and the silence was frequently disturbed by the fall of large masses of the soft earthy banks undermined by the strong current. On the afternoon of the 13th a stretch of river extending about six miles in a north-easterly direction was reached, which offered a beautiful prospect. The river widened to half a mile, with low green banks, while beyond a range of rugged mountains could be seen. At the end of the six-mile reach was a succession of high bluffs, caused by the foot-hills coming down to the river, with a narrow, rocky beach, the slopes wooded with pine and juniper. There were many very fragrant wild-flowers, and the mosquitoes were the only disturbing element. This, which was named Highland Camp, was about eighty miles from the entrance of the river. About one P.M., on the 14th of July, the mouth of the Squirrel River of the natives was reached, coming in from the north-east. Its source



ICE-CLIFFS ON KOWAK RIVER.

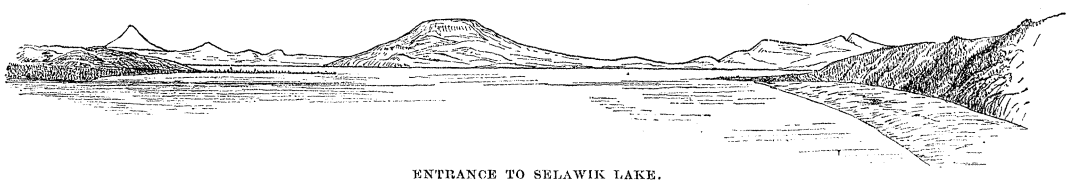
is in the mountains, one day's portage from the Nunatok, or some of its branches. Here three nearly equal waterways presented themselves, of which the middle one was chosen. The strength of the current made progress very difficult, and there were numerous bars. The right bank was high and rolling to the water side, where it formed a beach of variously colored limestone pebbles. Large masses of metamorphic rock cropped out among the dense growth of forest which lined the shore. On the left bank the land was low, being an island some ten miles long, whose upper end was reached about six P.M. On the following morning the river widened, the current became less, and the stream less crooked, and it was apparent that the party had passed the region of the mountains through which the river cuts its way. These mountains beyond the right bank rise over three thousand feet, heavily timbered at their bases, and trend nearly as the river runs. In the afternoon a large coal-vein was discovered in a bluff on the river-bank, and was extremely welcome for use in the steam-launch, though that on the surface had been weathered so as to partly impair its good quality.

This and the following day were rainy: so no observation could be had. The thermometer stood at about 90° F. At half-past six a deserted village was reached. The width of the river was from five hundred to nine hundred yards, and the depth of the channel from twelve to thirty feet. The following day another deposit of coal in a stratum of fine white clay suitable for pottery was found. This coal, however, did not burn well, probably on account of the admixture of clay. Later in the day the first rapids were reached, and passed with some difficulty; and in the evening the party halted at a fishing-village, where the natives, who were very honest and friendly, were preparing their nets for the expected run of salmon. As progress was made, the current became extremely strong, numerous rocks were found to exist alongshore, and it required much care to keep the launch from being thrown upon them by the force of the stream. Several villages and fishing-stations were passed, and small ripples or rapids became more numerous, so that the lighter boats easily outstripped the launch. On the 21st, having nearly reached the Jade Mountain, it was determined to divide the party, let the engineer and miner explore in the vicinity, while the launch was taken to a convenient spot for laying her up by Lieut. Cantwell, who would then rejoin them. The launch was left at a fishing-village, whose inhabitants informed them that the channel of the river above soon became obstructed by rocks, and ran in a sort of cañon, so that the natives do not attempt to navigate it. It divides into two branches, one of which takes its rise in a large lake (supposed to be twenty-five miles long), while the other rises farther to the eastward, near the head waters of the Koyukuk River, which enters the Yukon just above Nulato. The natives use birch canoes in this region. The river rose one foot during the night of the 22d; and the Innuit stated that the water was very high, but later, with dry weather, would fall, so that all the river-bed would be dry except the channel. Lieut. Cantwell, after repairing the furnace of the launch with the native fire-clay, left her to rejoin McLenegan and Miller with a party of Innuit. They were reached on the 24th, much exhausted by their trip, their boots worn out, pestered to an incredible degree by mosquitoes, but bringing some of the native jade and other minerals. They were sent to recuperate at the station where the launch had been left, while the others pushed on, and at noon reached a part of the river where it takes a sudden bend to the south-east, the country being low and rolling, backed by mountains on both sides. The Jade Mountain could be readily distinguished from the other peaks by its greenish color. The depth of water did not diminish. At half-past four P.M. a remarkable clay bluff, three-quarters of a mile long and a hundred and fifty feet high, was reached on the left bank of the river. Quantities of mammoth tusks were observed in this clay and its *débris* where undermined by the stream. The river now becomes very tortuous, with many islands, and tundra extending to the mountains. The soil is clayey, with a thick layer of black mould. In winter the natives, who at this time were fishing on the lower Kowak, ascend to the region of its head waters, and travel to trade with the Yukon Indians, *viâ* the Koyukuk River, or go still farther to the north-east to the range of the high Yukon Mountains, where moose and mountain sheep are found in great numbers. It was reported that on a clear day the sea (or a large lake) could be seen from these mountains in one direction. On the other side of the Yukon range is a river (doubtless the Colville) by which the sea can be reached in five days. On the 26th of July a point was reached where the river divides into two parts, the south-eastern of which was followed, on account of its more direct course, to a point where the Umakalūkta River comes in from the southward. This was narrow and crooked, soon diminishing to a mere torrent. Trees two feet in diameter, and very rank shrubbery, were observed on its banks. It was ascended to a village about twenty miles above its mouth, where the explorers were kindly welcomed by the inhabitants, some of whom had never seen a white man before. Boats could not be obtained here to replace the water-soaked skin-boat of the party; but they were told that they could from this place make a portage across to the Kowak, which they would reach from twenty-five to thirty miles above the point where the Umakalūkta joins it. This was determined upon, and the party camped at the village, enjoying some delicious fresh salmon.

The following day the portage was made over a hill to a small lake, then over tundra to a large lake which took four hours to cross, and then through a swamp to the Kowak again. For reasons connected with the supply of provisions and the worn state of the skin boat upon which the party depended for transportation, it was decided to return to the launch. It was supposed that there were, by native reckoning, about twelve days' farther navigation to the falls,

which terminated the navigable part of the river, which would now diminish in depth with every day of fine weather. From a hill near the camp, the river could be seen, winding along the foot of the mountains and off into level country beyond, while in the far distance snowy peaks were seen, from which the natives reported that the other peaks in which the Kowak takes its source could be seen on a clear day. At seven A.M., July 29, the party started down the river, descending with great velocity on the swift current. The mouth of the Notmoktowak or 'Pack' River, which drains the country between the Nunatok and Kowak, was examined, and the boat passed through several sloughs not observed in coming up. The boat leaked and needed repairs: so on the 30th Lieut. Cantwell left it to be mended, and started for the Jade Mountain, twelve miles away, on foot. The natives refused to accompany him, as the shaman declared evil would come to any one who visited the mountain. The tramp was fatiguing; but a torrent was reached which separates the mountain from a high, rugged peak of the same range. Large quantities of the green stone were found in the bed of the stream; but the mountain itself seemed actually to be entirely composed of it, and the sides of the cliffs were like polished glass for smoothness where they had been subjected to pressure or wear. About a hundred pounds of the mineral were collected; and, after a short nap, the party returned to the river, which they reached, almost exhausted by the heat, the bad travelling, and the torture of sand-flies and mosquitoes. On the 2d of August the party started down to meet the launch, whose boilers were so worn that she could not with safety attempt much more hard steaming against the current. Observations for position and declination were obtained at various points; and on the 6th of August, at two A.M., the party reached Highland Camp, where sundry articles collected on the up-trip were taken on board. On the following day the party camped on the shores of Hotham Inlet. The distance travelled up the river, including all tortuosities, was estimated at three hundred and seventy miles.

The remainder of their stay was devoted to the exploration of Hotham Inlet and Selawik Lake, and its associated rivers and lakes, during which some extremely valuable corrections to the charts were made. Selawik Lake is practically an extension through a narrow passage of Hotham Inlet. The main mouth of the Kowak River empties into the inlet close to the entrance of the lake, which on the south side is marked by a sand-spit projecting far out from the shore, forming a convenient boat harbor. The lake along its south shore is not very deep, and shoals off very gradually, so as to make landing difficult. The country is high, rolling tundra, forming a bluff bank behind the beach, covered with a thick growth of shrubbery. At intervals long spits extend far out from the shore, forming many small harbors or bays. The eastern end of the lake, where the shore trends to the north-west, is low and swampy, and the water very shoal, with a sort of bar parallel with the beach two hundred yards off. Here were myriads of water-fowl. A river comes in from the eastward about seventy-five yards wide, with from twelve to eighteen feet of water. This flows from a lovely little lake about five miles in diameter, almost entirely surrounded by mountains. A narrow creek enters the opposite side of the lake, and, ascending this, the large lake, Imogarik-cho-it, or Little Sea, of the natives is reached. The stream connecting this with Selawik Lake is called Kiaktuk or Fox River. The mountains visible from Selawik Lake border the eastern shore of Imogarik Lake, and extend nearly round it; but the northerly shore is quite low and marshy. Another branch, called the Igaiak River, connects Imogarik Lake and Selawik River about twenty-five miles from the mouth of the latter, by which Selawik Lake could be reached in two days. This was taken, and the junction of the Selawik and Igaiak rivers reached on the morning of Aug. 14. The banks of the Selawik differ little from those of the Kowak, except that the undergrowth is heavier. The width of the river varies from six hundred to a thousand yards, and in some places expands into bays a mile wide. The channel showed from four to six fathoms. From the mouth of the Igaiak, the Selawik trends about six miles in a north-westerly direction, and then south and west to Selawik Lake. Many small lakes and lagoons were observed near the river, and from a hill one large sheet of water was seen which lay near the foot of the mountains, about six miles from the river. That evening Selawik Lake was reached through a large bay filled with many islands, and the party camped on a sand-spit which formed the north point of entrance to the lake. About halfway from the river to the inlet a river comes into the lake from the mountains between the latter and the valley of the Kowak. The country here is low and marshy. The work was completed Aug. 16, and the party started down Hotham Inlet, of which a reconnoissance was made on their way. The bar at the mouth of Hotham Inlet was found to have no more than six feet of water on it anywhere at low water. On the 30th of August the party rejoined the Corwin about fifteen miles westward from Cape Blossom,



ENTRANCE TO SELAWIK LAKE.

and reported for duty without serious accident or illness of any of its members.

Reports on the minerals, birds, general character of the country and its inhabitants, the fur trade, etc., from Engineer McLenegan, accompany the report to Capt. Healy, commander of the Corwin, from which the above notes are derived. The Kowak abounds in salmon, pike, and white-fish, which are dried by the natives. The white spruce is the largest and most abundant tree. The natives are all Innuit or Eskimo; and their numbers in this region are estimated at three hundred and fifty on the Nunatok, two hundred and twenty-five on the Kowak, and two hundred and fifty on the Selawik lakes and rivers. The coal-belt is about thirty miles wide, and is probably lignitic, resembling the small seam near Nulato, on the Yukon. The 'color' of gold was obtained almost everywhere, but it is doubtful if it would pay to work it. Beds of a beautifully mottled serpentine, used by the natives for ornaments, were found in the mountains near the Kowak, as well as the so-called 'jade,' used far and wide for the most costly and elegant stone implements, which is perhaps the variety of pectolite recently described by Clarke from specimens got at Point Barrow. Seventy-seven species of birds were collected, mostly of species common to the Yukon region, among which the rock ptarmigan and white-tailed godwit (L. uropygialis?) are noteworthy, as well as the great white-billed loon (C. Adamsi).

Commercially the most important result of the expedition is the indication of a route by which whalers or others, held by the ice eastward from Point Barrow, might find a comparatively available way to the settlements on the Yukon, *viâ* the Colville and Kowak rivers, and through the Koyukuk valley. Geographically the journey of Lieut. Cantwell is the most important of the past year in America; and its results, taken in connection with those of Lieut. Stoney, who subsequently passed over nearly the same route, will give us an approximate knowledge of a considerable area which has hitherto been almost a blank upon the best maps.

THE CHOLERA BACILLUS. — KOCH'S REPLY TO HIS CRITICS.

THE doubts that have arisen in many minds in regard to the specific nature of the cholera bacillus of Koch may be in some measure dispelled by the latter's answers to his critics in a recent number of the *Deutsche medicinische wochenschrift* (No. 45, 1884). In it he shows the differences between the cholera bacillus and that found in the mouth (*Lancet*, Sept. 20, 1884), and then takes up the work of Finkler and Pryor. He shows that they have not obtained pure cultures (this from specimens of their own); that their bacillus is larger and thicker, more rapid in growth, and very different in 'culture-form.' In examinations of three cases of 'cholera nostras,' he failed to find the 'comma bacillus.' Koch has also succeeded in producing cholera by the inoculation of one one-hundredth of a drop of a solution of a pure culture. This produced death in rabbits and guinea-pigs in from one and a half to three days, when placed in the duodenum. The appearances *post mortem* were those of the human subject in death from Asiatic cholera.

In addition to this, we have the confirmatory evidence of E. van Ermengen in a communication to the Belgian microscopical society, Oct. 26, 1884 (*Lancet*, Nov. 29, 1884). This observer found the comma bacillus in the intestinal fluids of eight autopsies and thirty-four examinations of stools. He considers that its peculiar-shaped, chain-like groups and occasional wavy filaments distinguish it completely from other bacteria. He finds that it is more or less abundant, according to the stage of the disease; and in two cases (*foudroyant*) they were present almost as in a pure culture. They disappear during reaction.

Premonitory diarrhoea was not investigated for the presence of the organism, for lack of time. In cases of algide cholera, where no bacilli were found in the stools, culture of the most minute portion produced enormous numbers of the organism within twenty-four hours. He considers that the presence of the organism is diagnostic of cholera, and that the method of microscopic examination in conjunction with cultures should be adopted in all doubtful cases. By thus settling the diagnosis early, efficient prophylaxis against the spread of the disease may be established. He found no spores, and considers their absence probably established by the want of resistance to drying of this organism. He finds precisely the same differences between the cholera bacillus and those of Lewis and of Finkler and Pryor, and exactly the same objections to the latter's work, as does Koch (*loc. cit.*). He, as well as Koch, succeeded in producing cholera by inoculation of one drop of a culture, extending over four days (this in dogs, guinea-pigs, and rabbits). The cadaveric appearances were those of cholera; and the intestinal fluids contained many comma bacilli, from which further cultures were made. He thinks that the pathogenic action of these bacteria is very likely due to some product of their growth in the material in which they are sown, and closes his communication by advising that physicians generally should be instructed in the methods of microscopic search for these organisms in order to the early determination of the existence of the disease, and all that that implies. This is a recommendation which might be made in this country, and adopted with much benefit to the community at large.

Such observations as these furnish strong evidence that the world is again indebted to Koch for his labors in the investigation of disease, and that the links connecting his cholera bacillus with cholera as its specific cause are being forged into a complete chain of evidence.

In regard to the organism itself, we have received within a day or two a slide containing masses of bacilli from a pure culture. The preparation is a very beautiful one; and its authenticity is undoubt-

ed, inasmuch as it was put up and forwarded by Koch himself. It shows all the peculiarities of shape described by him, and most certainly bears out the assertion that it possesses distinguishing characteristics from other bacteria. In form and arrangement, it differs markedly from any other organism with which we are acquainted, either those found in the intestines or elsewhere.

SCIENCE IN MANCHESTER.

A centenary of science in Manchester. (In a series of notes.) By R. ANGUS SMITH, Ph.D., LL.D. London, *Taylor & Francis.* 475 p. 8°.

THE progress of literature and science in Manchester, Eng., is full of interest to Americans. It is not only that the city is full of life and vigor, and that its relations to the United States are very close, but there is a sort of western freshness in all its undertakings. Owens college is not yet forty years old; the Victoria university is more recent than Johns Hopkins; the Literary and philosophical society of Manchester is younger by several years than the American academy and the American philosophical society; and the Free public library is the junior of the Astor library in New York. Manchester has grown during this century more rapidly than Baltimore, and its wealth has increased at a rate which is still more remarkable. Under these circumstances, we have examined with some curiosity the volume prepared for the hundredth year of the Literary and philosophical society of Manchester, 1881.

Among the many honorable names commemorated in it, two are pre-eminent, — Dalton and Joule. The former established the science of chemistry on the basis of the atom: the latter ascertained the mechanical equivalent of heat. Referring to these great discoverers, Dr. Smith expresses his belief that there has been "a law in the recesses of humanity which has caused the influence of the community to concentrate itself, first into the Society, and then, through particular members, into the theory of chemistry, equivalents of atoms, and their connection with mechanical force, — the knowledge of which must influence mankind forever." Dalton's development of the atomic theory was preceded by other noteworthy contributions to science, — his discovery of color-blindness, his epoch-marking essays in meteorology, and his elaborate inquiry on the force of vapor; to all of which brief reference is here made.

Joule was a pupil of Dalton; "a follower," says Smith, "worthy of the prophet; . . . a pupil who has become the master of many learners." The relations of these two men are thus described. "The idea of units of *measure* in Dalton's mind developed itself gradually into the idea of units of *force* in the mind of Joule. . . . To say that the two are the most successful descendants of the great thinkers who have grappled with the subject of atoms for three thousand years, is but to express a simple fact; and to assert that Dalton and Joule have made the great leading discoveries on the subject is simply to follow history. From one we learn the order in which the ultimate particles of bodies move: from the other we learn the force and relation of their movements in those great phenomena, heat, electricity, and mechanical force."

There are other stars in the Manchester firmament. Among them are William Fairbairn, builder of the tubular bridge at Menai, a man of 'wonderful instinct' as an engineer; and his more scientific coadjutor, Eaton Hodgkinson. Sir John Hawkshaw, Sir Henry Roscoe, and Professor Balfour Stewart are famous among recent members of the society. The laboratory of Dr. Edward Schunck is said to be the finest private laboratory in the country. The founder of the society, Dr. Thomas Percival, a physician of great repute, who had the skill to elicit the best co-operation of other men, is commemorated by Dr. Smith as one who foreshadowed some of Darwin's views. His contemporary in the society, Charles White, Dr. John Ferriar and the three Henrys, also receive due notice; and so does Thomas Cooper, afterwards of Columbia, S.C., whose name has recently been brought to mind by allusions to it in the autobiography of Dr. Marion Sims.

The comments of Dr. Smith on the present state of the society are suggestive. First, he recognizes a disposition, on the part of the Manchester investigators, to send their papers to the Royal society of London. "It is useless to complain of this: it is a phase of national life, and it will probably grow stronger for a time, until this sub-centre becomes sufficiently brilliant to make men feel that it is an object of great ambition to become distinguished here." The writer thinks that Manchester has allowed its forces to be too much scattered. Next he pleads for enlarged quarters. The members of the society are unwilling to leave the rooms where Dalton studied, which were his home from morning until evening for the greater part of his life; but more space is demanded. Third, he answers the

criticism that the society gives 'no lectures, no *soirées*, no displays.' Fourth, he argues that original researches should be encouraged in Manchester, and that this society should inspire and aid such work. This leads him to mention the good influence of Owens college and the Victoria university. He closes the chapter with the strong assertion, which few men of science will dispute, that if Manchester, and many cities and countries besides, were obliterated from the earth, the loss would be less than it would be if the world should lose the influence which came from Dalton's atomic theory and from Joule's law of the mechanical equivalent of heat.

INDIAN SIGN-LANGUAGE.

The Indian sign-language; with brief explanatory notes of the gestures taught deaf-mutes in our institutions for their instruction, and a description of some of the peculiar laws, customs, myths, superstitions, ways of living, code of peace, and war-signals of our aborigines. By W. P. Clark, U.S.A. Philadelphia, *Hamersley*, 1885. 443 p. 8°.

The study of the gesture-speech of our Indians began in 1801, when Mr. William Dunbar read a paper on the subject before the American philosophical society, which was published in their Transactions. Only quite within the last decade, however, has the subject received the careful attention which it merits. In 1880 there appeared, under the auspices of the Bureau of ethnology, three works, or rather portions of the same work, from the pen of Col. Garrick Mallery, U.S.A., entitled "A collection of gesture signs and signals of the North-American Indians, with some comparisons" (distributed only to collaborators, and therefore one of the bibliographic rarities of the government press); "Introduction to the study of sign-language among the North-American Indians;" and "Sign-language among North-American Indians compared with that among other peoples and deaf-mutes." This last, which was printed in the first report of the Bureau of ethnology, is amply illustrated, and may be considered the completion of Col. Mallery's investigations in this direction. It includes a history of gesture-language in both the old and new world, its study as a phase of evolution, its prevalence in America, its relations to philology, its connection with the origin of writing and the interpretation of pictographs, and the bearings it has upon theories of syntax and etymology.

These applications are striking and instructive in a high degree, and vindicate the eminently important place which the philosophic study of gesture-speech must hereafter occupy in archeologic research. An excellent illustration of it is given by Dr. W. J. Hoffman, in an article on American pictography in the Transactions of the Anthropological society of Washington (vol. ii. 1883), where by its aid he translates in the most satisfactory manner a petroglyph from California, and an Innuit carving on ivory. Such a demonstration of the significant character of these primitive rock inscriptions and carvings was the more timely, since the distinguished ethnologist, Dr. Richard Andree, in his 'Ethnographische parallelen und vergleiche,' has condemned pretty much all these relics as the idle and meaningless amusements of savages.

Capt. Clark's work is a welcome addition to our knowledge of the subject. He speaks from long personal observation and a practical familiarity with this mode of communicating ideas. His studies began in 1876, and were continued for years, mainly within the limits of the plains or prairie tribes. As in Mallery's treatise, the words are arranged alphabetically, the signs following them, thus facilitating comparison. An advantage in Capt. Clark's presentation is, that he adds the mental conception or picture which the native forms to himself of the object or idea to be represented, thus furnishing a clearer meaning to the sign, and also enlightening the reader as to the psychology of the aboriginal thinker. His definitions are by no means confined to explaining the sign-language. He fully redeems the promise on his titlepage to describe the laws, customs, myths, and peculiarities of the tribes he names. These facts are all fresh, derived from original observation, and add a great deal to the available ethnological information of the prairie Indians.

Such material must, however, be used with caution. When (p. 10) the author infers from the myths of the Indians that there was a time, referred to in these narratives, in which the natives did not know the use of the bow and arrow, he attributes to these stories an antiquity which they by no means possess. The stemmed and barbed arrow-head was in use when the loess of the now long since dried-up Nebraska lakes was in process of formation, almost a geologic cycle ago.

In an appendix the author describes a number of signals with a blanket, a pony, or a mirror, and adds the explanation of various geographical names. It is a peculiarity that

we do not undertake to explain, that he nowhere alludes by name to those writers whose works have preceded his, and which we have mentioned in the earlier paragraphs of this notice.

CASTE IN INDIA IN 1881.

Outlines of Punjáb ethnography. By DENZIL CHARLES JELF IBBETSON of her Majesty's Bengal civil service. Calcutta, *Government*, 1883. 4°.

Imperial census of 1881. Digest of the results in the presidency of Bombay, including Sind. By order of government. Bombay, *Government*, 1882.

Report of the census of Bengal, 1881. By J. A. BOURDILLON of the Bengal civil service. Calcutta, *Secretariat pr.*, 1883.

THESE reports treat of about 109,000,000 of the 198,000,000 people of India. The Punjáb (near 23,000,000) has about 41% Hindus, 51% Mahometans, 7% Sikhs. Bombay and Sind (16,500,000) have 73% Hindus; Bombay alone, 84%. Bengal (69,500,000) has 64% Hindus. The chief strength of the Sikhs in India is in the Punjáb. The preponderance of other races and religions in the Punjáb gives a special field for inquiry how far caste is a Hindu institution.

Mr. Ibbetson deems the treatment of caste hitherto, including his own work, inadequate and unsatisfactory, and he recognizes that contradictory statements regarding the same people may be true in different localities. He says, —

> The popular and currently received theory of caste I take to consist of three main articles:
>
> 1°. That caste is an institution of the Hindu religion, and peculiar to that religion alone;
>
> 2°. That it consists primarily of a fourfold classification of people in general, under the heads of Bráhman, Kshatriya, Vaisya, and Súdra;
>
> 3°. That caste is perpetual and immutable, and has been transmitted from generation to generation, throughout the ages of Hindu history and myth, without the possibility of change.
>
> Now, I should probably be exaggerating in the opposite direction, but I think that I should still be far nearer the truth, if, in opposition to the popular conception thus defined, I were to say, —
>
> 1°. That caste is a social far more than a religious institution; that it has no necessary connection whatever with the Hindu religion, further than that under that religion certain ideas and customs common to all primitive nations have been developed and perpetuated in an unusual degree; and that conversion from Hinduism to Islám has not necessarily the slightest effect upon caste:
>
> 2°. That there are Bráhmans who are looked upon as outcasts by those who, under the fourfold classification, would be classed as Súdras; that there is no such thing as a Vaisya now existing; that it is very doubtful indeed whether there is such a thing as a Kshatriya, and, if there is, no two people are agreed as to where we shall look for him; and that Súdra has no present signification save as a convenient term of abuse to apply to somebody else whom you consider lower than yourself; while the number of castes which can be classed under any one or under no one of the four heads, according as private opinion may vary, is almost innumerable:
>
> 3°. That nothing can be more variable or difficult to define than caste; and that the fact that a generation is descended from ancestors of any given caste, creates a presumption, and nothing more, that that generation also is of the same caste, — a presumption liable to be defeated by an infinite variety of circumstances.

Mr. Ibbetson gives 275 pages to the consideration of religions, races, castes, and tribes of the people of the Punjáb, and justice to his work is hardly possible in a brief space. Summing up as to evolution of caste, he says: —

> Thus, if my theory be correct, we have the following steps by which caste has been evolved in the Punjáb:
>
> 1°. The tribal division common to all primitive societies;
>
> 2°. The guilds based upon hereditary occupation common to the middle life of all communities;
>
> 3°. The exaltation of the priestly office to a degree unexampled in other countries;
>
> 4°. The exaltation of Levitical blood by a special insistence upon the necessarily hereditary nature of occupation;
>
> 5°. The preservation and support of this principle by the elaboration from the theories of the Hindu creed or cosmogony of a purely artificial set of rules, regulating marriage and intermarriage, declaring certain occupations and foods to be impure and polluting, and prescribing the conditions and degree of social intercourse permitted between the several castes. Add to these the pride of social rank and the pride of blood, which are natural to man, . . . and it is hardly to be wondered at that caste should have assumed the rigidity which distinguishes it in India.

He holds that caste in the Punjáb is primarily based on occupation, and, with the masses owning and cultivating land, upon political position, which brings in the tribal element. The trades-guild type of caste, found chiefly in the large cities, owes its existence largely to the prevalence of Mahometan ideas. "The people are bound by social and tribal custom far more than by any rules of religion. . . . The difference [between Hindu and Mussulman] is national rather than religious." In some cases Mahometanism has here strengthened the caste bonds of its adherents. The four castes leading in number in the Punjáb are Jats, probably of Indo-Scythian stock (agriculturists and ploughmen); Rajputs,' Sons of Rajas' (largely land-owners, preferably pastoral, and avoiding personal ploughing); Brahmans, priestly and Levitical; Chuhras; the scavengers; numbering respectively about 4,500,000, 1,500,000, 1,000,000, and 1,000,000.

In Sind little detail was observed in abstracting information respecting caste. In the Bombay presidency 84% of the people are Hindus. Caste is not discussed elaborately in the Digest of the census, but incidentally the views of Mr. Ibbetson as to the close relation of occupation, tribe, religion, and caste, are sustained by the unnamed official who prepared the Digest. Among the 200 pages of tables, one table shows 'Class and name of caste,' 'Hereditary occupation,' ratios occupied in certain general pursuits, and, under 'Remarks,' more definitely the numbers actually occupied in pursuits not hereditary. The largest caste is the Kunbi, or cultivators, of the Maratha districts, and next the Mahar and Dhed, unclean castes, village servants. Brahmans and Rajputs lead socially. Over 830 castes are recognized, the forty-page index for which, unfortunately, was not bound in the copy of the Digest at hand. Mr. Bourdillon (Bengal) avoids discussion of caste farther than it was necessary for general tabulation of caste enumeration. He quotes the instructions of the census committee of India in this: —

> We have no hesitation in saying that there is no part of the work of compilation which presents so many difficulties, involves so much labor, and at the same time is so unsatisfactory when completed, as the working-up of the caste tables."

The committee did not encourage minute research as to caste, and it is only by a sort of cross-examination that we can trace Mr. Bourdillon's views as compared with Mr. Ibbetson's. Under caste, however, he speaks of "the interest of the caste question being much more ethnological than statistical," — the race idea. The Bengal tables deal only with 'Hindu castes;' but Mr. Bourdillon tells us, under 'Religions,' that

> The term 'Hindu' now denotes neither a creed nor a race, neither a church nor a people, but is a general expression devoid of precision, and embracing alike the most punctilious disciple of pure Vedantism, the agnostic youth who is the product of western education, and the semi-barbarous hillman who eats without scruple any thing . . . and is as ignorant of the Hindu theology as the stone which he worships in times of danger.

And he quotes approvingly from Mr. Beverley: —

> So does the Hindu religion in Bengal assume a Protean form, from the austere rites practised by the shaven pundits of Nuddea to the idol-worship of the semi-barbarous Boona. The Bauris . . . are probably all of aboriginal extraction, but have adopted as their religion a form of Hinduism, and can scarcely be classed as other than Hindus.

In chapter ix., after stating that the Gwalla or the cowherd caste is largest, Brahmin second in numbers, Kaibartha (husbandmen of lower Bengal) third, Mr. Beverley says, "The Koch, who occupy the fourth place, afford a striking example of the way in which Hinduism is replenished," and goes on to explain how a people, once with a language and a religion, as well as a government, of its own, has been absorbed by Islamism and Hinduism, in which latter the converts are, to all intents and purposes, low-caste Hindus. Many names are given that are to be interpreted as occupation or as castes interchangeably, and heredity of caste and of occupation is distinctly named. Under 'Religion' Mr. Beverley gives a general statement of absorption of aboriginal tribes into Hinduism, their ruling classes being absorbed into the warrior caste, while the common people became low-caste Hindus.

The principal point on which there may be a diversity of view as to caste between the census officers is as to its existence among non-Hindu peoples. There is no evidence of antagonism in their general views, and it is not clear that there would not be essential harmony if each wrote fully on the subject.

Other provincial census reports should shortly be received from India, to aid our investigations. Meantime we may recognize some suggestions of caste in the relations of race, occupation, and social position, among western nations. In more than one locality in the United States a lady finds that her cook will not make a bed, the chambermaid will not dress the infant, the nurse will not broil a steak, and, with a houseful of servants, no one will clean the clothes, which are sent to a washerwoman. Actual scavengers have hardly higher social rank in America than in India, where distinction, varying here with daily changes of wealth and of occupation, become moulded into family and religious permanence.

Mr. Ibbetson reminds us that "William Priest, John King, Edward Farmer, and James Smith are but the survivals in England of the four *Varnas* of Menu."

PALMISTRY.

Handbook of modern palmistry. By Prof. V. DE METZ. 2d ed., with 8 illustrations. New York, *Thompson and Moreau, pr.* [1883.] 8+130 p. 16°.

ALTHOUGH written apparently with something curiously like an honest intent, this book is a piece of absurd claptrap, — utterly irrelevant

deductions from monstrous assumptions, affectations of impossible learning mingled with a mass of mere jargon, calculated to sound like science to the vulgar. The whole makes such a farrago as might of itself send its writer to the lunatic-asylum, in which he would certainly prove a distinguished ornament — that is, if he is honest in his madness. Still, those who are minded to find 'sermons in stones, and good in every thing,' may get useful matter for reflection from it.

First, he may learn that the palmist art of divination is one of the oldest and most widespread, as well as the longest to survive, of superstitions. It is perhaps natural that men should try to make some interpretations of the curiously varied lines of the human hand. It would be easy for a primitive people to frame a fancy that the likeness, and at the same time the variety, of the lines in the hands of men, had something akin to the like and the unlike elements of all men's lives. It was, perhaps, from the ever-present longing for light on the great mystery, that some one of old hit on the conjecture that these lines that toil gives to the hand were prophecies of the life that the mortal was to lead. There at once sprang up systems of interpretation less apparently scientific than those of the astrologers, yet quite as credible, and winning as much credence in the olden time as did the predictions of the star science. There was a great mass of superstition of this same general nature afloat among all early peoples. Astrology, from the largeness of its claims, and the dignity of its pretended subject-matter, the action of the stars, has always held the first place in the hierarchy of humbugs. Next comes the interpretation of dreams, then divinations by signs, then palmistry, and at last a variety of less determined means of divination, — the flight of birds, the aspect of their entrails, etc. Where these notions have taken any strong hold upon the people, they have certain common features that show them, one and all, to be the bastard brothers of true science. They all rest upon that idea of likeness in nature which precedes the understanding of cause and effect. Man is always ready to find the unexplored clouds of nature 'very like a whale,' or 'backed like a camel,' at the bidding of any one who will affect superior discernment, and promise him to rend the future's veil. The more remote the likeness, the more undisciplined men will strain to note it, and, noting, the more implicit their belief in it.

Such books as this mark the remains of the old truth-searching impulse, which, in its first active shape, gave us superstitions, but which, finally united with a critical spirit, gave us true learning. They indicate a stronger survival of the old spirit of superstition than is commonly supposed to continue in educated communities.

Divination has a higher place in the common mind than most well-trained men are disposed to believe: even in our best educated communities, it is still, as of old, a well-paid profession. In the leading paper of Cambridge, Mass., published within a stone's throw of the university, a professed divinator has kept for years a large business-like and soberly worded advertisement of his services. The circulation of this paper is not among the lower classes: on the contrary, its principal *clientèle* is among the more intelligent people. The present writer is informed that a good many speculators base their 'futures' on the predictions they obtain from these wizards. We have managed to varnish our American people with an appearance of modernism; but our school system, with its imperfect scientific training, makes no efficient battle against these pernicious relics of the past. It leaves the child without that sense of natural law which alone can overthrow such superstitions.

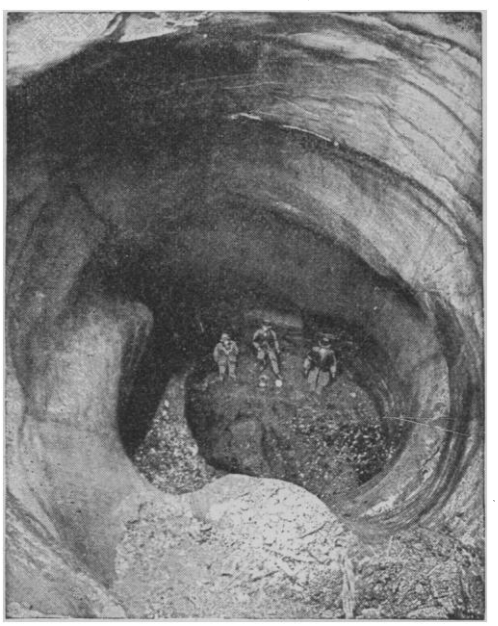
We cannot dismiss these indications of a low state of mind with the grin with which one is disposed to treat them. That a considerable part of our people still believe in witchcraft is indeed a serious matter. The machinery of our modern society rests on the theory that men are guided by a common sense of cause and effect. In any serious turn of affairs, when action must rest on the general rationality of the people, those who support these wizards will prove unfit for trust. Our system of education should be shaped to meet this evil. Children should be forced to see that they live under a reign of law: to leave them longer, with nothing to check this strong inherent tendency to base superstition, is to leave rotten timber in the ship of state.

NOTES AND NEWS.

THE 'cold-wave flag,' whose use has been inaugurated by the signal-service during the past autumn, is intended to be displayed not only at the regular stations of the signal-service, but also at as many railway-stations and post-offices as possible, in order to spread the widest notice of the coming change of weather. The service cannot at present undertake to provide the flags or to pay for special telegrams to numerous local display-stations; but the cost of the flags (white, six feet square, with a two-foot black square in centre) is moderate, and can easily be borne

by those interested in securing early indications of falling temperature; and in several parts of the country the telegrams are sent to all the stations on certain railroads that co-operate with the signal-service, and thus promptly distribute weather-forecasts to the towns along their routes. It is probable that the coming year will see a considerable extension of this kind of weather-service.

— The report on the terminal moraine in Pennsylvania, by Prof. H. Carvill Lewis, published by the geological survey of that state, gives the detailed observations on which was based the *résumé* that has already appeared in *Science* (ii. 163). The volume opens with a characteristic preface by Professor Lesley; and the description of the moraine along its irregular course follows in nearly three hundred pages, with numerous sketch maps and artotypes. The latter illustrate types of landscape having a strikingly glacial form, especially well shown in the morainic deposits of Cherry valley, Monroe county (pl. x., xi.); and include a remarkably fine view of a scratched bowlder (pl. v.). Students of glaciology are already familiar with observations showing the small regard paid by the ice-sheet to hills and ridges in its path. The effects of a similar indifference to local topography are seen in the direct course of the moraine across valleys; for the opinion that separate glaciers ran down each river-valley like a series of tongues projecting beyond the margin of the united glacial sheet is not sustained by Professor Lewis's investigations. The same report contains a note by Professor Lesley describing a remarkable monument — if a hole can be so called — of glacial action. This is a pot-hole found last winter by the men at work in the Ridge (coal) mines of Messrs. Jones, Simpson, & Co., Archibald, Luzerne county, Penn. It is twenty feet in diameter and forty feet deep, and when found was full of round stones, gravel, and fine sand; on removing this, the walls of the natural air-shaft were disclosed, showing the sandstone cut through clean and smooth, down and into the underlying coal-bed. The adjoining coal was found in perfect condition. Flanges of rock rise spirally from the lower part of the cavity toward the surface. The cut here given is taken from a photograph by Mr. Henry Frey of Scranton, Penn., who has also published larger views, looking out of as well as into the hole. A second pot-hole is also reported, two miles from the above locality, near Messrs. Winton & Dolph's mines.



POT-HOLE FOUND IN A PENNSYLVANIA COAL-MINE.

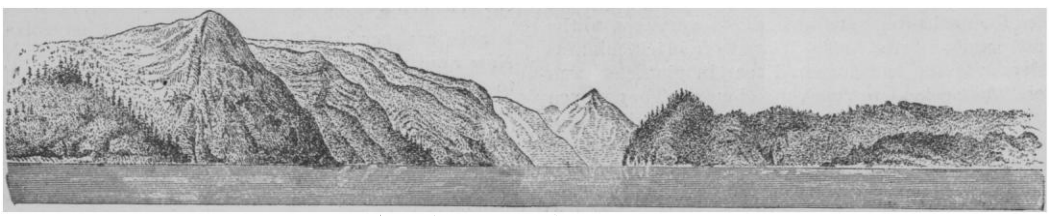
In the October number of the *American journal of science*, Mr. Lewis discusses the validity of observations on supposed glacial action at eleven points in Pennsylvania south of the terminal moraine, all of which he has visited. He concludes that they are all non-glacial, some being simple water-worn gravels, others being ice-rafted bowlders, while the scratches reported in two localities are pronounced slickensides and plant-fossils. The glacial action reported in Virginia needs similar re-examination.

— Capt. H. W. Chetwynd, R.N., chief inspector of lifeboats in Great Britain, having been directed to test the use of oil in calming troubled waters, reports that his experiments show that there is little difference in the effect produced by the various oils of every-day use; very small quantities of either colza, linseed, fish, seal, or paraffine oil being found sufficient to cover a considerable space with the smooth glassy surface characteristic of oil on water. The effect of this oily film was most marked on moderate breakers, as it entirely stopped their breaking, and left only a gentle swell; but, on surf such as might endanger the safety of a lifeboat, the oil had but little and often no calming effect. On several occasions, when a larger breaker than usual rose in a moderate surf which the oil had 'killed,' the oil was powerless to check it; and the sea broke through it, covering the boat, gear, etc., with oil. It failed, also, to have an effect on breakers caused by a heavy ground-swell. To be any protection, oil must be applied to the sea from the boat or vessel in the direct line from which the seas are advancing, and at a sufficient distance to give it time to spread and act upon the waves before they reach the vessel. This could be done in a lifeboat only in two positions: 1. When anchored, and lying head to sea and tide; 2. When running dead before the sea for the shore. In any other position, even supposing the oil to be calming the water, it would probably be impossible to keep the boat within its influence, and proceed towards a wreck or other desired point, at the same time. Under these circumstances, Capt. Chetwynd is of the opinion that no practical advantages can arise from the use of oil by the lifeboats of his institution, and he cannot recommend its being issued to them. He states,

however, that these experiments clearly demonstrate that in many cases it would prove a material protection to ordinary open boats in a dangerous surf, and he strongly urges its adoption for use in such cases.

— Capt. Klein of the German bark Kron Prinz von Preussen, making passage from Rio de Janeiro to Baltimore, reports encountering on Nov. 30 and Dec. 1 a very strong current from south-east one-eighth south, which he estimated at 3.2 knots per hour. The wind was blowing a whole gale from the north-east and north, and his vessel was hove to for twenty-four hours. His position at noon on Nov. 30 was, latitude 34° 29′ north, longitude 74° 22′ west; and on Dec. 1, latitude 36° 5′ north, longitude 73° 20′ west. The captain, being unable to account for this unusual current, took six observations between noon of Nov. 30 and noon of Dec. 1 to verify the fact.

— The earlier editions of the Coast pilot of Alaska, prepared by Davidson, and published by the Coast-



KASA-AN BAY, CAPE GRINDALL, E. ¾ N. 12 MILES. (*From U.S. Hydr. Office, Chart No. 225.*)

survey in 1867 and 1869, are now succeeded by a new work, exhaustive of all known sources of information, compiled by Mr. W. H. Dall, assisted by Mr. Marcus Baker. This is entitled 'Pacific coast pilot, Alaska, part i.,' and gives sailing-directions, with charts and views, for the inland passage from the north end of Vancouver's Island to Dixon's entrance, and thence along the coast of our distant possessions to Yakutat Bay, where the shore-line turns westward. Much additional surveying is needed to attain final accuracy, as the coast is fringed with many islands, and is greatly broken by long, irregular fiords. In the northern part especially, it is bold and mountainous, and numerous glaciers descend close to water-level. The accompanying figure gives a view of Kasa-an Bay, and recalls the abruptness of the Norwegian coast.

— *Nature* states that Prof. G. H. Darwin of Cambridge, and Professor Daniel Oliver of the Royal gardens, Kew, have been nominated by the council of the Royal society for the award of the two royal medals conferred by the crown. The Copley medal is to be given to Professor Carl Ludwig of Leipzig, in recognition of the great services which he has rendered to physiological science; Professor Tobias Robertus Thalén of Upsala is to have the Rumford medal for his spectroscopic researches; and the Davy medal is awarded to Prof. A. W. H. Kolbe, also of Leipzig, for his researches in the isomerism of alcohols. The two Leipzig professors are foreign members of the society. Professor Darwin and Professor Oliver are fellows, — the former well known for his mathematical investigations on the rigidity of the earth and on tides; the latter, for his investigation of the classification of plants, and for the important services which he has rendered to taxonomic botany.

— The work of establishing secondary meridians of longitude on the west coast of Central and South America by means of the submarine cable, which was undertaken by Lieut.-Commander C. H. Davis, U.S.N., has been completed. Stations were established at various points between La Libertad, San Salvador, and Valparaiso; and the differences of longitude between Valparaiso, Arica, Lima, Payta, Panama, and La Libertad, were determined. The measurements between La Libertad and Guatemala were made in co-operation with Mr. Miles Rock of the Guatemala survey. From Valparaiso, signals were exchanged with Dr. Gould at Cordova for the purpose of connecting the measurements made on the west coast with those made on the east coast of South America in 1878 and 1879. The observations are now being reduced, and prepared for publication.

— The bureau of navigation of the Navy department announces that the computations and discussions of the observations and experiments for determining the velocity of light have been completed, and are being prepared for publication.

— The Navy department reports that the 'electric plant' for incandescent lighting, which was supplied to the U. S. S. Trenton, has given great satisfaction, notwithstanding some defects in the insulation of the wires, and has added materially to the comfort and health of the officers and crew, and therefore the Atlanta, Boston, and Omaha are to be lighted by electricity. The plant for the Atlanta will be supplied by the U. S. electric-lighting company of New York; that for the Boston, by the Brush electric company of Cleveland; and that for the Omaha, by the Consolidated electric-light company of New York. The merits of the various systems may thus be determined.

— A group of beetles known as the Stenini has received attention at the hands of Lieut. Casey in a brochure of more than two hundred pages. It brings us another step toward the aggregation of the material for a more or less complete monograph of our Staphylinidae. The work has been carefully and conscientiously done from the author's stand-point, and but little adverse criticism can be made except in the

following particulars: there is an evident tendency to divide species upon small details of sculpture, fortunately checked, as the author admits, where the specimens are numerous; but the summary admits eighty-eight species in a hundred and seventy-two, founded on only one and two specimens, — an unparalleled percentage in any monographic work on Staphylinidae ever published. The descriptions are unnecessarily verbose and tiresome, and could have been abbreviated by half with advantage to both author and reader. The division of Stenus, in which the author believes himself to have taken the initiative, is unnecessary and untenable. The genus Areus of Casey has already been separated by Motschulsky (*Bull. Mosc.*, 1860, i. 556) under the name Hemistenus, but has found no followers.

— The American brigantine Senoruta was in latitude 35° 50′ north, longitude 74° 12′ west, at meridian, Nov. 16, and experienced the severe storm of that date. About two P.M., when it was blowing very hard from the north-east, five whirlwinds were seen to the southward and eastward. They were black columns of water about four hundred feet in diameter, and their tops seemed to reach the clouds. They moved with great velocity at right angles to the wind, and, after passing the vessel, disappeared to the northward and westward. Four went ahead of the vessel, and one astern, within a half-mile. The whirlwinds were moving at the rate of twenty-five or thirty miles an hour. The appearance of waterspouts in the midst of a gale, and moving at right angles to the wind, is quite unusual.

— The molluscan fauna of the Silurian period in Götland is illustrated in a fine quarto, with numerous plates by Prof. G. Lindström of Stockholm, published by the Swedish academy. It comprises the gastropods and pteropods, and is, perhaps, the first paper which treats at all fully of the Silurian members of these groups, and contains much of interest, both new and old. A Silurian genus of Chitons (Chelodes), a remarkable Patellid (Tryblidium), and a very large number of forms allied to the recent Pleurotomariae, are fully described. The presence of Subulites, and other siphonostomatous gastropods in Silurian times, is demonstrated, and some extremely singular new genera made known. The text is in English, and the whole work extremely creditable to its learned author, and useful to the paleontologist.

— An additional discovery by Dr. Lindström, in the same rocks, is worthy of special notice. In beds which are said to be the equivalent of our Niagara group, he has discovered a remarkably well-preserved scorpion, of which a photograph is before us. That it was air-breathing, though found in a purely marine deposit (into which it was probably washed), is proved by the fact that one of the stigmata is plainly visible. Dr. Thorell, one of the foremost students of Arachnida in the world, and Dr. Lindström, are preparing a paper upon it, and have given it the name of Palaeophoneus nuncius. No scorpions, nor indeed any Arachnida, have before been found fossil in beds lower than the carboniferous deposits, in which some twenty-five species have been found in this country and Europe; yet this Silurian example is more perfect than any specimen of a fossil scorpion from any formation. It presents some marked peculiarities, but it seems to be unquestionably a scorpion.

— In his 'Contributions to the tertiary geology and paleontology of the United States,' Prof. A. Heilprin has collected a series of six papers, mostly from the publications of the Philadelphia academy of sciences. Mr. Heilprin does not recognize the existence of any pliocene strata in the eastern and southern portions of the United States. A map which is added embraces only the tertiaries of the Atlantic and Gulf coast regions, and the lower Mississippi valley. This is the first time that a succinct statement of the tertiary geology of the eastern United States has been attempted; and Professor Heilprin has produced a work which will be valuable to those who may undertake the exhaustive study of the eastern tertiaries, which they so much need.

— In a paper read before the Linnean society of New South Wales, Oct. 29 last, Dr. Lendenfeld contests the views of the French physiologists, that the position and movements of the wings of insects are merely the results of the mechanical influence of the resisting air, and gives instances where muscular contraction had been clearly proved.

— The committee on organization of the Ninth international medical congress, to be held in the United States in 1887, met in Washington, D.C., on Nov. 29, 1884, for the determination of the general plan of the congress, the election of officers of the committee who will be nominated to fill the same offices in the congress, and the consideration of questions of finance. The officers elected are as follows: president, Dr. Austin Flint, sen., of New York; vice-presidents, Dr. Alfred Stillé of Philadelphia, Dr. Henry I. Bowditch of Boston, Dr. R. P. Howard of Montreal, Canada; secretary-general, Dr. J. S. Billings, U. S. army; treasurer, Dr. J. M. Browne, U. S. navy; members of the executive committee (in addition to the president, secretary-general, and treasurer), Dr. I. Minis Hays of Philadelphia, Dr. A. Jacobi of New York, Dr. Christopher Johnston of Baltimore, Dr. S. C. Busey of Washington. The executive committee will proceed at once to complete the work of organization.

— The next meeting of the Society of naturalists of the eastern United States will be held at Washington, D.C., on Monday and Tuesday, Dec. 29 and 30, 1884. By the courtesy of the Smithsonian institution, the society will have the use of the lecture-room of the institution for its meetings. The first session will be on Monday the 29th, at ten A.M. promptly. It is expected to have a discussion on the teaching of natural history in colleges.

— The San Diego society of natural history has received an addition to its herbarium of seven hundred species of southern and lower Californian plants. This series of plants will be known as the Orcutt herbarium.